1. A composite membrane for use in an electrochemical apparatus or process comprising:

a) a polymeric sheet comprising polymer and having a porous structure,

b) said polymeric sheet having distributed in the polymer:

i) inorganic particulate;

ii) metal;

iii) an organic polymer; or a combination thereof, and

c) said porous structure being at least partially filled with an ion-exchange resin to provide ionic conductance for use in the electrochemical apparatus or process.

2. The membrane of claim 1 wherein the polymeric sheet has distributed therein an inorganic finely divided powder.

3. The membrane of claim 1 wherein the polymeric sheet has distributed therein a precious metal.

4. The membrane of claim 1 wherein the polymeric sheet has distributed therein silica.

5. The membrane of claim 1 wherein the polymeric sheet has distributed therein fumed silica.

6. The membrane of claim 1 wherein the polymeric sheet has distributed therein titania.

7. The membrane of claim 1 wherein the polymeric sheet has distributed therein carbon.

8. The membrane of claim 1 wherein the polymeric sheet has distributed therein platinum.

9. The membrane of claim 1 wherein the polymeric sheet has distributed therein platinum supported on a substrate.

10. The membrane of claim 1 wherein said polymeric sheet is expanded porous PTFE, and said ion-exchange resin fills substantially all pores of the expanded porous PTFE.

11. The membrane of claim 1, wherein the polymeric sheet has inorganic particulate distributed therein.

12. The membrane of claim 1, wherein the polymeric sheet has metal distributed therein.

13. The membrane of claim 1, wherein the polymeric sheet has an organic polymer distributed therein.

14. The membrane of claim 1, wherein the polymeric sheet has a thickness of less than 50 microns.

15. The membrane of claim 1, wherein the membrane is disposed between two fuel cell electrodes.

16. The membrane of claim 15, wherein the membrane disposed between two fuel cell electrodes provides a steady state current of at least 1.178 amps/cm^2 at 0.5 volts, with no humidification of incoming fuel cell air and hydrogen reactants, with air and hydrogen feed both at 40 psig and 25°C, and the fuel cell temperature at 50°C.

17. The membrane of claim 16, wherein the polymeric sheet has a thickness of less than 38 microns.

18. A composite membrane for use in an electrochemical apparatus or process comprising:

a) a polymeric sheet comprising polymer and having a porous structure and a thickness of less than 50 microns,

b) said polymeric sheet having distributed in the polymer inorganic particulate, metal, or a combination thereof;

c) said porous structure being at least partially filled with polymeric gel that contains electrolyte to provide ionic conductance for use in the electrochemical apparatus or process.

19. The composite membrane of claim 18, wherein said porous structure is substantially filled with polymeric gel than contains electrolyte.

20. A composite membrane for use in an electrochemical apparatus or process comprising:

a) a polymeric sheet comprising polymer and having a porous structure,

b) said polymeric sheet having distributed in the polymer inorganic particulate, metal, or a combination thereof,

c) said porous structure being at least partially filled with a polymer composition that contains metal salts to provide ionic conductance for use in the electrochemical apparatus or process.

21. The composite membrane of claim 20, wherein said porous structure is substantially filled with a polymer composition that contains metal salts.

22. The composite membrane of claim 20, wherein the polymeric sheet has a thickness less than 50 microns.

23. The composite membrane of claim 22, wherein the polymeric sheet has a porosity of 40% to 95%.